

# Usefulness of a standing frame to improve contraversive pushing in a patient post-stroke in inpatient rehabilitation

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## ABSTRACT

Despite the negative functional and financial implications of contraversive pushing (CoP) in the post-stroke population, little research has focused on improving this phenomenon more rapidly. A 58-year-old man was admitted to inpatient rehabilitation with a large frontoparietal intracerebral hemorrhage resulting in significant left hemiparesis and CoP. A standing frame protocol was implemented into standard care to improve CoP. The patient was assisted into a standing frame daily, and the Burke Lateropulsion Scale and Functional Independence Measure were tracked. Improvements in both outcome measures were greater than normative data.

**KEYWORDS** Contraversive pushing; inpatient rehabilitation; lateropulsion; physical therapy; pusher; stroke

Contraversive pushing (CoP), also known as pushers syndrome or lateropulsion, following stroke is an altered perception of the body's orientation with respect to gravity.<sup>1,2</sup> This results in a postural preference toward the more affected side of the body with resistance to attempts to return to a midline position.<sup>2</sup> Patients with CoP have decreased gains of function and higher rates of discharge to dependent settings.<sup>2</sup> They will reach the same functional status and discharge disposition as those without CoP but require an additional 3.6 weeks to do so, leading to an increase in health care dollars spent.<sup>3</sup> Despite the well-documented implications of CoP, little research has focused on strategies to reduce pushing, and no high levels of evidence are available to indicate best practice. Supported standing is often achieved early post-stroke using a standing frame (SF), allowing the therapist to monitor tolerance for upright positions while assessing for hypotension. Notably, previous research has indicated no benefits of passive supported standing for motor recovery or independence with mobility after stroke.<sup>4,5</sup> To date, no studies have assessed the effect of passive supported standing on CoP. This case report describes the implementation of an SF protocol for a patient with CoP post-stroke in inpatient rehabilitation.

## CASE DESCRIPTION

A 58-year-old man was admitted to a large urban inpatient rehabilitation unit after 24 days in an acute hospital

due to large right frontoparietal intracerebral hemorrhage. He presented with confound deconditioning and dense left hemiparesis, including no active movement, impaired sensation and proprioception, increased tone, and left inattention. In addition, he presented with dysphagia, dysarthria, and cognitive deficits, including slowed processing, impaired problem solving, and decreased initiation. Functionally, he was dependent for all mobility and daily living tasks and was significantly limited by CoP.

Efforts to assist the patient into the SF were attempted daily and incorporated into therapy. Initially, the SF was used during individual sessions due to the need for frequent blood pressure assessments. However, once the patient was consistently tolerating being upright, these sessions were completed in a group setting. Two outcome measures were collected. The primary outcome measure was the Burke Lateropulsion Scale (BLS), which assesses CoP post-stroke. It is valid, reliable, and more sensitive in detecting mild pusher behavior and small changes<sup>1,6,7</sup> and is the only measure to assess CoP during supine positioning and ambulation.<sup>6</sup> Scores range from 0 to 17, with lower scores indicating less CoP. The patient's BLS results are shown in [Table 1](#). The second measure was the Functional Independence Measure (FIM), which has 18 items scored on a 7-point scale focusing on mobility, self-care, and cognition. FIM is widely used as a primary measure of dependency, and lower scores indicate lower function. FIM efficiency (FIM change per day) tracks

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Received November 7, 2018; Revised March 6, 2019; Accepted March 7, 2019.

**Table 1. Timeline for resolution of contraversive pushing using the Burke Lateropulsion Scale**

Date	Burke Lateropulsion Scale score	Total time in standing frame (minutes)
Admit assessment	11/17 (moderate CoP)	0
Admit assessment + 6 days	10/17 (moderate CoP)	90
Admit assessment + 14 days	3/17 (mild CoP)	185
Admit assessment + 24 days	0/17 (no CoP)	380

CoP indicates contraversive pushing.

**Table 2. Functional Independence Measure results before and after discharge<sup>a</sup>**

Measure	Admit	Discharge
Bed to/from chair transfer	1	3
Toilet transfer	1	3
Walk	1	1
Wheelchair	1	4
Stairs	1	1
Eating	1	5
Grooming	1	3
Bathing	1	2
Upper body dressing	1	4
Lower body dressing	1	2
Toileting	1	2
Comprehension	3	4
Expression	2	3
Social interaction	2	3
Problem solving	1	2
Memory	2	3
Change, admit to discharge		33
Efficiency		1.1

<sup>a</sup>1 indicates total assist; 2, maximal assist; 3, moderate assist; 4, minimal assist; 5, supervision.

how quickly a patient progresses.<sup>8</sup> *Table 2* shows the patient's results on the FIM.

The patient spent 30 days in the unit and was in the SF 18 of 20 days of therapy. During this time, he participated in 1540 minutes of physical therapy: 1015 minutes of therapeutic activities, 150 minutes of gait training, 80 minutes of therapeutic exercise, and 295 minutes of neuromuscular re-education. The patient spent 380 total minutes in the SF, equating to 24.6% of physical therapy time. SF sessions did not replace standard care physical therapy. Rather, they replaced what would likely be a speech or occupational therapy group session, as CoP was identified as the patient's

primary limitation to progress. Initially, the time in the SF was limited by orthostatic hypotension, but overall it was well tolerated by the patient with no adverse events and provided low burden on the therapists.

## DISCUSSION

The patient made improvements in both outcome measures. Notably, he demonstrated moderate CoP at admission and no CoP 24 days from initial BLS assessment. In a retrospective analysis of a sample of 169 patients, CoP resolved in 62% after 6 weeks and in 79% after 3 months.<sup>9</sup> Additionally, one study with a sample of 8 patients with CoP reported complete recovery of pusher behavior at a mean duration of 15.3 weeks.<sup>10</sup> Despite the somewhat inconclusive data regarding typical resolution of CoP, the patient in this case report recovered more quickly than patients in previous reports.

Consistent with existing research, the patient made mobility and activity of daily living improvements as his CoP improved.<sup>2</sup> In a retrospective analysis, Babyar et al found an average FIM efficiency for patients presenting similar to the patient in our report to be 0.8. Our patient's FIM efficiency of 1.1 was higher than this mean, indicating a more rapid recovery of functional independence.<sup>11</sup>

The SF can be utilized early upon admission to evaluate tolerance for standing. Notably, it is often used with the stroke population for "midline orientation," although there is no evidence that this is effective. The SF is often discontinued once a patient is actively standing. With the management of the patient in this case study, daily utilization of the SF (EasyStand Evolv; see *Figure 1*) continued beyond the time when the patient was able to actively stand with maximal assist and was no longer limited by orthostatic hypotension. The premise of use of the SF in this manner is based on previous studies encouraging upright posture and verticality as an emphasis of treatment.<sup>12,13</sup> In 2004, Roller identified a preserved ability in patients with CoP to align the body to vertical using visual cues from the environment, and this can be utilized to improve orientation to midline.<sup>12</sup> In addition, a previous case series reported positive results from a Lokomat<sup>14</sup> (which, like the SF, passively places the patient in midline). Additionally, Wong et al found a positive effect of supported standing on stance symmetry in the hemiplegic



**Figure 1.** The patient using the EasyStand Evolv.

population.<sup>15</sup> However, this has not been directly assessed in patients with CoP.

The effect of our SF protocol on patient outcomes could be attributed to existing theories regarding neuroplasticity, although a larger sample with additional data points would be required for further examination. Yet, Kleim and Jones described the importance of repetition of practice to relearning after damage to the brain. Maximizing the time a patient spends upright and in midline increases the repetition of normalized postures and therefore could lead to more rapid recovery of midline orientation by facilitating neuroplasticity.<sup>16</sup>

There is a strong need for evidence-based interventions to improve CoP more efficiently. The design of this protocol is of particular interest, because the intervention does not require new training, can be completed in a group setting, and can apply to a variety of settings. Though results of this case are promising, future studies with rigorous designs are required to determine the impact of an SF protocol on CoP.

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